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(54) Engine control system for controlling in-cylinder fuel injection engine

In order to provide a system that lower NOx emission and an improved fuel consumption are obtained by making the igniting control possible in the wide operation range by performing the fuel injection and the ultra lean burning with the homogeneous air-fuel mixture, in the engine (13) having the compression igniting mode, in the in-cylinder fuel injection engine having the compression igniting mode, means for performing the first fuel injection for the initial combustion speed control before igniting and the second fuel injection for the engine torque control after that, are provided. The second fuel injection ratio for the engine torque control is increased according to the engine torque. Furthermore, in order to improve the igniting, the igniting trigger means is provided in the in-cylinder fuel injection engine (13) having a compression igniting mode and the igniting trigger is added by the igniting trigger means after the first fuel injection.

30 30d 30d 30d 30d 28 40 23 29 41 20 22 21 7 25 10 11 31 15 35 7 0 6

FIG. 1



EUROPEAN SEARCH REPORT

Application Number EP 00 10 9121

		ERED TO BE RELEVANT		
Category	Citation of document with i of relevant pas	ndication, where appropriate. sages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CI.7)
X	EP 0 886 050 A (TOY 23 December 1998 (1 * column 9, line 48 * column 11, line 6 * column 11, line 6	998-12-23) 3 - column 10, line 36 * 5 - line 13 *	1-3	F02P5/04 F02D41/30 F02D37/02 F02D41/40 F01L9/00
(US 5 027 764 A (REI 2 July 1991 (1991-0		13,15,16	
r	* abstract *	,, 02,	5-8,11, 12,18,19	
	* column 1, line 11 * column 1, line 31 * column 2, line 48 * claims; figures *	line 42 * :- line 56 *		
X	DE 195 19 663 A (DA 15 May 1996 (1996-0	5-15)	1,3,13, 14	
Y	* column 3, line 46 * claims; figures *	- column 5, line 15 *	5-8,11, 12,17	
Y	() 26 February 1998 * page 10, line 1 - * page 21, line 3 - * page 25, line 4 - * page 35, line 10 * page 38, line 15 * page 40, line 8 - * page 54, line 18	INC (US); HUNTER GARY L (1998-02-26) page 12, line 22 * line 21 * line 17 * - page 36, line 23 * - page 39, line 13 * page 41, line 9 * - page 55, line 8 * - page 66, line 17 * -/	17-19	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F02D F01L F02B
	Place of search	Date of completion of the search	l	Examiner
	THE HAGUE	13 September 2002	Libe	eaut, L
X : parti Y : parti docu A : tech O : non-	ATEGORY OF CITED DOCUMENTS icularly relevant if laken alone icularly relevant if combined with anotiment of the same category nological background written disclosure mediate document	E : earlier patent doci after the filing date	ument, but publis the application r other reasons	shed on, or

FPO FORM 1503 03 82 (PO4001)



EUROPEAN SEARCH REPORT

Application Number EP 00 10 9121

	Citation of document with the	RED TO BE RELEVANT	Relevant	CLASSIFICATION OF THE
Category	of relevant passa		to claim	APPLICATION (Int.CI.7)
A	GEMISCHANSAUGENDEN V SELBSTZUENDUNG" MTZ MOTORTECHNISCHE FRANCKH'SCHE VERLAGS TECHNIK. STUTTGART, vol. 53, no. 2,	HANDLUNG,ABTEILUNG DE, 2-02-01), pages 80-85,	1-20	
Α-	GB 2 327 980 A (FORD 10 February 1999 (19 * the whole document -	99-02-10)	1-20	
				TECHNICAL FIELDS SEARCHED (InLCI.7)
		-		
	The present search report has bee	an drawn un for all claims		
	Place of search	Date of completion of the search		Examiner
	THE HAGUE	13 September 2002	Libe	aut, L
GA X:partic Y:partic	TEGORY OF CITED DOCUMENTS ularly relevant if taken alone ularly relevant if combined with another nent of the same category	T : theory or principle E : earlier patent doci after the filing date	underlying the in- iment, but publish the application	vention

E-O FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 00 10 9121

This annex lists the patent family members relating to the patent documents cited in the above—mentioned European search report. The members are as contained in the European Patent Office EDP file on.

The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-09-2002

Patent document cited in search report		Publication date		Patent family member(s)		Publication date	
F P	0886050	Α	23-12-1998	JP	11072038	Α	16-03-1999
Ç.	0000000	,,	20 12 1111	EP	0886050	A2	23-12-1998
				US	6182632	B1	06-02-2001
US	5027764	Α	02-07-1991	NONE			
DE	19519663	Α	15-05-1996	DE	19519663	A1	15-05-1996
MU 	9807973	A	26-02-1998	AU	4082997	Α	26-03-1998
	300,370	• •		AU	4158097	Α	06-03-1998
				CN	1233313	Α	27-10-1999
				EΡ	0928369	A 1	14-07-1999
				JP	2000514526	T	31-10-2000
				WO	9810179	A2	12-03-1998
				WO	9807973	A1	26-02-1998
				US	2001017127	A1	30-08-2001
				US	6286482		11-09-2001
				US	2002026926	A1 	07-03-2002
GB	2327980	A	10-02-1999	DE	69805076	D1	29-05-2002
	202.700	• •		DE	69805076	T2	29-08-2002
				ΕP	1000231	A1	17-05-2000
				WO	9906683	A1	11-02-1999
				JP	2001512208	T	21-08-2001
				US	6227151	B1	08-05-2001

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82